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Manuscript Title: LIt.search : Fast tracking access to Aboriginal and Torres Strait Islander health literature

1st Author Name (including middle initial): Tieman, JJ
Qualifications: BSc (Hons), MBA, PhD
Position: Associate Professor, Palliative and Supportive Services
Institution or Affiliation: Flinders University
Address: GPO Box 2100, Adelaide 5001, South Australia
Email: jennifer.tieman@flinders.edu.au

2nd Author Name (including middle initial): Lawrence, MA
Qualifications: BA Library & Information Management
Position: Research Assistant
Institution or Affiliation: Flinders University
Address: GPO Box 2100, Adelaide 5001, South Australia
Email: mikaela.lawrence@flinders.edu.au

3rd Author Name (including middle initial): Damarell, RA
Qualifications: BA, Grad Dip Info Stud, AALIA
Position: Liaison Librarian for Medicine
Institution or Affiliation: Flinders University
Address: GPO Box 2100, Adelaide 5001, South Australia
Email: Raechel.damarell@flinders.edu.au

4th Author Name (including middle initial): Sladek, RM
Qualifications: PhD, MPH, BA (Library & Information Management; Psychology)
Position: Senior lecturer in Medical Education
Institution or Affiliation: Flinders University
Address: GPO Box 2100, Adelaide 5001, South Australia
Email: ruth.sladek@flinders.edu.au

5th Author Name (including middle initial): Nikolof, A
Qualifications: BA
Position: Program Manager: Enabling Policy and Systems
Institution or Affiliation: The Lowitja Institute
Address: 7 Hackney Road, Hackney, SA 5069
Email: arwen.nikolof@lowitja.org.au

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Ms Nikolof is employed as a Program Manager with the Lowitja Institute. Drs Sladek and Tieman, Ms Lawrence and Ms Damarell have no competing interests.

Abstract word count	178

Objective: To develop and validate a PubMed search filter, *LIt.search*, that automatically retrieves Aboriginal and Torres Strait Islander health literature, and to make it publicly accessible through the Lowitja Institute website.

Methods: Search filter development phases included: (a) scoping of the publication characteristics of Aboriginal and Torres Start Islander literature, (b) Advisory Group input and review, (c) systematic identification and testing of MeSH and text word terms, (d) relevance assessment of the search filter's retrieved items, and (e) translation for use in PubMed through the web.

Results: Scoping study analyses demonstrated complexity in the nature and use of possible search terms and publication characteristics. The search filter achieved a recall rate of 83.1% in the test set. To determine real world performance, post-hoc assessment of items retrieved by the search filter in PubMed was undertaken with 87.1% of articles deemed as relevant. The search filter was constructed as a series of URL hyperlinks to enable one-click searching.

Conclusion: *LIt.search* is a search tool that facilitates research into practice for improving outcomes in Aboriginal and Torres Strait Islander health and is publicly available on the Lowitja Institute website.

What is known about this topic? Health professionals, researchers and decision makers can find it difficult to retrieve published literature on Aboriginal and Torres Strait Islander health easily, effectively and in a timely way.

What does this paper add? This paper describes a new web-based searching tool, LIt.search, which facilitates access to the relevant literature.

What are the implications for practice? Ready access to published literature on Aboriginal and Torres Strait Islander health reduces a barrier to the use of this evidence in practice. LIt.search encourages the use of this evidence to inform clinical judgement and policy and service decision making as well as reducing the burdens associated with searching for community practitioners, academics and policy makers.

Text word count	2521

Introduction

"Closing the Gap" is important, not just as a policy agenda, but also as part of the daily clinical and care delivery responsibilities of health professionals throughout Australia. The need for a comprehensive response to the health status of Australia's Indigenous peoples has been well documented.[1-3] However, for health professionals and the health system to contribute to improvements, there is a need to ensure that what is known to be effective from research and from practice is used. Competent engagement with the relevant literature base is an essential pre-requisite to use this knowledge, and knowledge infrastructure that supports and encourages this engagement is needed.[4] While the ready availability of bibliographic databases has streamlined access to published literature, finding the right information is not as simple as typing "Aboriginal Health" into a search box. Ironically, research findings about Aboriginal and Torres Strait Islander health can be published without improving health because users never found the relevant information.[5] Kelly and St Pierre-Hansen's study of literature retrieval using the term "Aboriginal" highlighted some of the difficulties encountered when searching for Indigenous literature. They noted that evolving political and cultural contexts and constructs and indexing systems developed in the 1960s contributed to uneven retrievals.[6] A recent study investigating the effectiveness of health librarians and researchers at finding a known set of articles dealing with Aboriginal and Torres Strait Islander health showed that on average only 53% of these articles were retrieved by the experts' searches.[7] This confirms difficulties in searching reported in many studies and summarised in a review of search effectiveness.[8,9] Maximising the likelihood of appropriate literature retrieval through facilitated searching would be a valuable tool in Aboriginal and Torres Strait Islander health, increasing the opportunity for the available evidence to be used in clinical, service and policy choices.

Search filters are a research-based, technologically-driven strategy to improve searching outcomes.[10] Search filters are experimentally tested search strategies designed to optimally retrieve literature with a specific characteristic in a particular bibliographic database. There are already a number of published search filters that can help retrieve articles reporting on a study methodology such as randomised controlled trials[11] as well as topic based search filters such as heart failure[12] or renal.[13] While a search filter can be created for use in any specific database, the majority have been developed for use within Medline. This reflects the size of the database and the contribution of the Medical Subject Headings (MeSH) thesaurus. Obviously not every research publication is held on Medline. However, studies have demonstrated the contribution that this database makes to the knowledge base for Aboriginal and Torres Strait Islander health.[6] Importantly, the Medline database can be accessed through PubMed, an open access search interface. Given the depth and breadth of content

held on PubMed and its ready availability, all researchers, clinicians, guideline developers, health care administrators and healthcare policy makers interested in the published research evidence in Aboriginal and Torres Strait Islander health need to be able to utilise the evidence held in this powerful resource.

The aim of this project was to develop a search filter (LIt.search) to retrieve Aboriginal and Torres Strait Islander health literature and to make the search filter available as an open access web based tool utilising the publicly available PubMed database. The project was conducted by Flinders Filters, a specialist bibliometric research group, with funding and support from the Lowitja Institute, Australia's National Institute for Aboriginal and Torres Strait Islander Health Research.

Methods

The project involved a number of discrete phases. These are outlined and briefly described below.

1. *Scoping Study*: A preliminary analysis of three sets of published literature held on the Lowitja Institute website was used to articulate characteristics of literature relevant to Aboriginal and Torres Strait Islander health. Details on where the items were published and indexed, and the natural language terms and subject headings used to describe the items were extracted.
2. *Advisory Group:* The Advisory Group brought together academics, researchers and practitioners working in Aboriginal and Torres Strait Islander health. Their input and feedback was essential to developing the search filter and determining its functional utility.
3. *Gold Standard (GS):* A gold standard set provided references to analyse for MeSH term and text word candidates for the search filter as well as providing a dataset to test the contribution of terms individually and collectively when building the search filter. A series of possible GS options were identified and presented to the Advisory Group for final decision on the most representative and appropriate choice of Gold Standard. The GS articles were compiled as a citation set in OvidSP Medline. The GS was divided into three sets – Term Identification Set (TIS), Filter Development Set (FDS) and Filter Validation Set (FVS) to reduce sampling and validation bias.
4. *Term Identification:* Candidate terms for inclusion in the search filter were identified through frequency analysis of the TIS, review of the MeSH thesaurus, and recommendations from the Advisory Group. Tests were also performed in OvidSP Medline to determine the best truncation for the text word terms such as Indigenous, Aboriginal, and Torres Strait Islander.
5. *Filter Development:* Recall of each individual text word and MeSH term was established. Recall is the proportion of all articles in one of the gold standard sets retrieved by an individual MeSH term or text word or search string. Where a term was

not uniquely related to Aboriginal and Torres Strait Islander health (eg rural and remote), a relevance assessment was completed. Candidate terms were then tested in sequential combinations to assess their recall. The Search Filter was the search construction that achieved the highest recall in the FDS.

6. *Validation of the Search Filter:* The Search Filter's performance was assessed in the FVS. As well two external literature sets were used to test the filter's effectiveness: (a) Closing the Gap Clearinghouse assessed collection for health and (b) studies and papers selected for inclusion in 36 Aboriginal and Torres Strait Islander health systematic reviews.
7. *Post-hoc Relevance Assessment:* The search filter was then run in OvidSP Medline and the first 250 retrievals were dual reviewed for relevance to Aboriginal and Torres Strait Islander health by Advisory Group members.
8. *Translation of the Search Filter for use in PubMed:* As PubMed is made up of two datasets, indexed and non-indexed, the PubMed Search Filter needs to combine two search strings to maximise retrievals within both datasets.[14] A technical translation to ensure equivalence of performance between the OvidSP Medline and the PubMed indexed set was completed. As well, text word variants to retrieve items in the non-indexed set were tested to create a search string for this set. The post-hoc relevance of the non-indexed string was established. The full PubMed Search Filter combined the search string tested for equivalence from the OvidSP Medline search filter and the search string that optimised retrieval in the non-indexed set.
9. *Development of LIt.search:* Finally the PubMed Search Filter syntax was prepared as a URL and combined with a set of related topic searches to enable one-click hyperlink based searching through the Lowitja Institute website.

Results

The scoping study showed that Medline and Informit are key databases for literature relevant to Aboriginal and Torres Strait Islander health and that journal articles are the main type of publication cited. An analysis showed that the 165 scoping study articles were spread across 77 separate journals. The scoping study confirmed that there was not a specific MeSH term only describing Australian Aboriginal and Torres Strait Islanders. The key MeSH term, Oceanic Ancestry Group, covers peoples whose ancestral origins are from the islands of the South Pacific. Similarly, the natural language terms "Aboriginal" and "Indigenous" were highly sensitive but not unique to Aboriginal and Torres Strait Islander peoples. Some specific terms were identified such as Torres Strait Islanders, Murri and Koori. The scoping study also demonstrated that articles relevant to Aboriginal and Torres Strait Islander health dealt with a broad-ranging set of clinical, population and public health issues.

Seven GS options were identified and presented to the Advisory Group. Following considerations of the benefits, difficulties and possible biases associated with each option, the Advisory Group chose a random sample of 1,000 citations from the Aboriginal and Torres

Strait Islander Health Bibliography as the preferred option for the gold standard set. This test set was considered to be most representative of the type of literature being sought. To create this set, 2,500 items were downloaded from the Aboriginal and Torres Strait Islander Health Bibliography. After removing duplicate citations and non-journal publication types and checking for availability on OvidSP Medline, the final GS comprised 971 items from 257 unique journals. The articles were randomly allocated to the TIS (n=271), FDS (n=350) and FVS (n=350). Twenty three MeSH terms and text words were identified that occurred in more than 5% of the TIS articles.

Testing of the terms in the FVS showed that two constructs were at play – Indigenous/Aboriginal and Australia. Hence, retrieval analysis was conducted on the two concepts individually to maximise retrieval, and then retrieval was analysed when combining the concepts. The final six-term OvidSP Medline Aboriginal and Torres Strait Islander health search filter comprises two MeSH terms and four text word terms as outlined in Box 1.

The OvidSP Medline Version achieved a recall rate of 83.1% in the FVS, 92.9% in the systematic review references and 93.6% in the Closing the Gap assessed collection (Table 1). The equivalence study between OvidSP Medline and PubMed for the indexed set showed equivalent retrieval in the two datasets. Testing of text words to retrieve non-indexed articles that were “lost” without a MeSH term identifier led to the development of a text word search string that reduced non-retrieval from 12.1% to 8%.

Post-hoc assessment by the Advisory Group of the relevance of the retrievals identified by the OvidSP Medline Search Filter and the PubMed non-indexed search string were 81.2% and 87.2% respectively (Table 1). In other words, the searches were not only retrieving relevant literature but were removing irrelevant literature.

Potential topic searches to be combined with the search filter and held as one-click hyperlink searches on the Lowitja Institute website were identified by the Advisory Group, by staff of the Lowitja Institute and established through frequency analysis of topics in GS articles. The final set comprises 27 topics outlined in Table 2.

Discussion

In an area such as Aboriginal and Torres Strait Islander health, access to published research is critical in understanding and remediating inequities in healthcare access, healthcare quality, and health outcomes. Evidence capture needs to cover not only therapeutic efficacy but the effectiveness of implementation activities and the identification of outcome changes.

This study has showed that it is feasible to create a search filter to retrieve literature relevant to Aboriginal and Torres Strait Islander health and to make this search filter available as a hyperlink through a public website. Brokered searching using a search filter removes many of the traditional difficulties associated with individual search construction by clinicians,

researchers and policy makers. It also enables ongoing capture of the existing and emerging evidence and literature ensuring that the knowledge base is continuously current. As materials are added to the bibliographic database they become available for retrieval by the search filter. This approach to searching supports knowledge translation, or the use of evidence in practice, by removing a barrier associated with non-retrieval and/or irrelevant literature retrieval.

Difficulties in retrieval and the characteristics of the literature identified in earlier studies such as publication scatter[15], and terminology use and search construction[16] were also found in this research. Journal publication scatter suggests that comprehensive retrieval of published literature on Aboriginal and Torres Strait Islander health requires more than monitoring the table of contents of a selected set of journals which are presumed to contain the relevant literature. The process of experimentally analysing and testing search options demonstrated the complexity involved in concept definition and search formation to achieve appropriate recall. Without rigorous testing to establish performance, searches may be retrieving at suboptimal levels. This has implications for individual clinical decision making and for retrieval to support guidance development and policy making.

There are limitations to bibliometric research which should be noted. Any gold standard set may be subject to potential sources of bias and influence the utility and effectiveness of the search filter. While post-hoc relevance assessment provides an estimate of precision, testing on a mixed set of known relevant and on-relevant items could provide further detail on its positive predictive value. Indexing itself can be subject to variation and retrieved items will reflect this variability.

While the OvidSP search filter is a valuable resource, creating a version for use within PubMed enhanced the filter's value by increasing its availability to those who do not have access rights to subscription platforms. For health service areas that are based in community settings, particularly in rural and remote areas, this can be critical. Developing a search string to capture the non-indexed literature in PubMed also enhances currency by ensuring that the literature is not lost to users in the period before indexing. Utilising the online environment adds further to the filter's functional utility. By creating URLs that incorporate the search filter and syntax to connect it to the PubMed interface, it is possible to provide one-click searching. For health professionals and community providers, quality information retrieval can now be achieved via topic based weblinks held at www.lowitja.org.au/litsearch.

While the LIt.search tool makes it easy to find the relevant articles in PubMed, the scoping study showed that relevant material is also held in other databases. The research used to develop the search filter also helped to identify important search strings that could be applied in any major bibliographic database. Specific searching advice has been developed for Informit, CINAHL, Sociological Abstracts and PsycINFO based on the text words from the search filter.

Finally, it should be recognised that literature on health issues and approaches for other Indigenous peoples could provide different perspectives on Australian Aboriginal and Torres Strait Islander health.[17] The model used in creating LIt.search could be used to develop search filters to capture evidence and information about Indigenous peoples from other countries. A network of independent but connected Indigenous health search filters could capture the literature from Australia and other countries making it easy to find the emerging and existing literature on Indigenous health from around the world with a single click. As well as capturing evidence on interventions and approaches that have been used, such search filters could also be used to identify common experiences that have impacted on the health of Indigenous peoples around the globe.

Conclusion

Effective information retrieval is an essential step in using knowledge from research and practice to improve outcomes in Aboriginal and Torres Strait Islander health. Much of this literature is published in journals and indexed in bibliographic databases where search mediates retrieval. A new search filter to retrieve Aboriginal and Torres Strait Islander health literature has been experimentally developed and validated. Importantly, this searching tool is publicly accessible through the Lowitja Institute as a suite of hyperlinks enabling one-click searching for the Aboriginal and Torres Strait Islander health literature held in PubMed.

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Tables and Figures: 3

Figure 1: OvidSP Medline, PubMed indexed and PubMed non-indexed versions and PubMed Search Filter

OvidSP Medline Search Filter

((exp Australia/ OR Australia$.ti,ab.) AND (Oceanic ancestry group/ OR aborigin$.ti,ab. OR indigenous.mp.)) OR torres strait$ islander$.ti,ab.

PubMed Search String (Indexed Set)

((australia[mh] OR australia*[tiab]) AND (oceanic ancestry group[mh] OR aborigin*[tiab] OR indigenous[tw])) OR (torres strait* islander*[tiab])

PubMed Search String (Non-indexed Set)

((((au[ad] OR australia*[ad] OR australia*[tiab] OR northern territory[tiab] OR northern territory[ad] OR tasmania[tiab] OR tasmania[ad] OR new south wales[tiab] OR new south wales[ad] OR victoria[tiab] OR victoria[ad] OR queensland[tiab] OR queensland[ad]) AND (aborigin*[tiab] OR indigenous[tiab])) OR (torres strait* islander*[tiab])) NOT medline[sb])

PubMed Search Filter (Indexed and non-indexed sets)

((((australia[mh] OR australia*[tiab]) AND (oceanic ancestry group[mh] OR aborigin*[tiab] OR indigenous[tw])) OR (torres strait* islander*[tiab])) AND medline[sb]) OR *((((au[ad] OR australia*[ad] OR australia*[tiab] OR northern territory[tiab] OR northern territory[ad] OR tasmania[tiab] OR tasmania[ad] OR new south wales[tiab] OR new south wales[ad] OR victoria[tiab] OR victoria[ad] OR queensland[tiab] OR queensland[ad]) AND (aborigin*[tiab] OR indigenous[tiab])) OR (torres strait* islander*[tiab])) NOT medline[sb])**

*Note: The MeSH indexed component is in normal type and the text word version to retrieve in the non-indexed section is shown in italics.

Table 1: Retrieval and Post-hoc Relevance Assessments		
OvidSP Medline search filter performance in the three validation sets		
Testing set	**Citations retrieved**	**Recall**
Filter Validation Set	291/350	83.1%
Full Gold Standard Set	823/971	84.8%
External Validation Set: Reviews	379/408	92.9%
External Validation Set: Assessed Collection	44/47	93.6%
Post-hoc relevance assessment estimates		
First 250 citations retrieved	**No. deemed relevant by EAG**	**Relevance**
OvidSP search filter	203/250	81.2%
PubMed non-indexed search string	218/250	87.2%

Table 2: List of topics searches for inclusion in LIt.search tool				
Health status	**Protective and Risk Factors**	**Health conditions**	**Health Services**	**The Health System**
Maternal Health Child health Prisoner health Eye health Ear health Oral health Sexual health Social and emotional wellbeing	Preventative health Drug and alcohol Tobacco	Chronic disease management Cancer Diabetes	Health services Hospitals Palliative care Primary health care	Continuous quality improvement Governance Health policy Workforce Capacity building Systematic reviews or randomised controlled trials Research development and implementation Social determinants Closing the Gap